

Soil Quality - Introduction

USDA Natural Resources Conservation Service

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What is soil?

Soil is a living, dynamic resource that supports plant life. It is made up of different size mineral particles (sand, silt, and clay), organic matter, and numerous species of living organisms. Soil has biological, chemical, and physical properties that are always changing.



What does soil do for us?

Soil provides a physical matrix, chemical environment, and biological setting for water, nutrient, air, and heat exchange for living organisms.

Soil controls the distribution of rainfall or irrigation water to runoff, infiltration, storage, or deep drainage. Its regulation of water flow affects the movement of soluble materials, such as nitrate nitrogen or pesticides.

Soil regulates biological activity and molecular exchanges among solid, liquid, and gaseous phases. This affects nutrient cycling, plant growth, and decomposition of organic materials.

Soil acts as a filter to protect the quality of water, air, and other resources.

Soil provides mechanical support for living organisms and their structures. People and wildlife depend on this function.

What is Soil Quality?

Soil quality is the fitness of a specific kind of soil to function within its surroundings, support plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation.



How is soil quality important to landowners?

Soil quality enhancement is important to support crop, range, and woodland production and to sustain water supplies. Enhanced soil quality can help to reduce the onsite and offsite costs of soil erosion, improve nutrient use efficiencies, and ensure that the resource is sustained for future use. It is also essential to maintain other resources that depend on the soil, such as water quality, air quality, and wildlife habitat.

How can soil quality be evaluated?

Soil quality and soil health can be evaluated by monitoring several indicators. The type of indicator chosen depends on the soil function and scale (i.e. field, farm, watershed, or region) in which the evaluation is made. For example, an indicator of soil loss by erosion may be the thinning of the surface layer or visual and physical evidence of gullies, small rills, adjacent sediment, etc. Indicators for physical, chemical, and biological conditions can be simple field tests or sophisticated laboratory analyses.

Soil quality indicators may be considered diagnostic tools to assess the health of the soil or else as a cause for concern to the farmer, producer, rancher, woodland manager, or gardener, to stimulate a change in management. Trends in soil health can help in planning and evaluating current land use practices. The information gathered from monitoring soil health can be used to improve conservation recommendations.

How can my awareness of soil quality be applied?

Soil quality can be applied through several natural resource approaches:

- Data from soil surveys, fertility labs, and field tests can help identify areas where natural soil properties (texture, drainage, etc.) or management related problems currently exist. Once these conditions are identified, corrections can be planned.
- Areas with potential resource problems can be identified and shown on soil interpretive maps. These fragile areas that can easily be damaged may need more intensive management to prevent damage or be converted to a less demanding land use.
- After installing conservation practices, trends in soil quality can be tracked to show the success of the practice or the need for other management changes.

What concerns are addressed by soil quality?

- Loss of soil material by erosion
- Deposition of sediment by wind or floodwaters
- Compaction of layers near the surface
- Soil aggregation at the surface
- Infiltration reduction
- Crusting of the soil surface
- Nutrient loss or imbalance
- Pesticide carryover
- Buildup of salts
- Change in pH to an unfavorable range
- Loss of organic matter
- Reduced biological activity and poor residue breakdown
- Infestation by weeds or pathogens
- Excessive wetness

(Prepared by the National Soil Survey Center in cooperation with the Soil Quality Institute, NRCS, USDA, and the National Soil Tilth Laboratory, Agricultural Research Service, USDA)

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